FILTER

The present invention relates to a filter.

Filters are used in technology in many instances or in many processes to separate out particles contained in a medium passing through the filter. Filters are therefore used in dishwashing machines in particular to filter out food remainders contained in the rinse water. In dishwashing machines there is the particular problem of having to then remove the separated food remainders from the filter.

To solve this problem two panes with parallel longitudinal slots are provided in a self-cleaning filter, known from DE-A1-29 45 929, which are on one hand arranged offset to one another with respect to the slot direction by 90° and on the other hand are arranged to move axially relative to one another. In one position the panes rest on one another, with the intersecting longitudinal slots thus forming small square passage openings, effectively trapping particles which are larger than the passage cross-section of these small passage openings. Cleaning the filter is performed by altering the direction of flow, with at least one filter pane being shifted axially relative to the other filter pane, so that from this point on the longitudinal slots form the passage openings. The previously separated particles can be removed through these longitudinal slots which are substantially larger in cross-section, so that the filter is again clear. This type of filter design is structurally expensive. There is also the danger of jamming the mobile filter panes, and a change in the direction of flow of the medium passing through the filter is necessary to complete the cleaning procedure.

The object of the invention is to provide a filter which no longer embodies these disadvantages.

The solution to this task is achieved according to the present invention by the passage cross-section of the filter openings being varied automatically, depending on a variable inherent to the medium passing through the filter. To be able to perform cleaning in such a filter for example, it only requires the relevant variable inherent to the medium flowing through the filter. The modification in cross-section of the filter openings caused by such a change enables the filter to be rinsed free of deposited particles. The alteration to the variable inherent to the medium, e.g. temperature or flow rate, is easier to achieve than a change in the direction of flow. The invention produces a filter which obviates the abovementioned disadvantages.

A particularly advantageous embodiment of the filter is characterised in that the filter openings are screened or covered over by means, whose position relative to the filter openings can be altered under the influence of the heat of the medium passing through the filter. In this way the passage cross-section of the filter openings can be influenced, depending on the temperature of the medium flowing through the filter. Since in many technical processes a change in temperature occurs in the medium passing through the filter, cleaning of the filter is practically compulsory.

A structurally particularly simple design of the filter results from the filter being a perforated plate with perforations approximately identical to those of a filter plate, whereby the perforated plate is shifted by means of elements on the filter plate under the

influence of the heat of the medium passing through the filter. The perforated plate is moved at a specific temperature of the medium passing through the filter into a position approximately level with the openings of the filter plate, resulting in enlargement of the passage cross-section.

The elements are effectively spring elements, which vary in their effective length under the influence of the heat of the medium passing through the filter. The structure is further simplified through use of automatically adjusting spring elements.

In a particularly advantageous manner the elements comprise a shape memory alloy. Such alloys change their shape or position, for example under the influence of heat. That is, when a certain temperature is reached they assume another form or take up another position and return to their original shape or position whenever the original temperature prevails. Because in many technical processes a change in temperature occurs in the medium passing through the filter, cleaning of the filter is thus practically compulsory.

A structurally particularly simple configuration of the filter results from the spring elements being supported on the one hand against a fixed edge and on the other hand against an edge of the perforated plate, effectively avoiding special, additional fastening means.

In accordance with a preferred embodiment of the invention an element is affixed to the perforated plate, by which the change in length of the element is transferred directly to the perforated plate as a change in the position of the perforated plate.

A further, structurally even simpler embodiment of the filter is characterised in that an element is assigned a reset spring arranged on an opposite side of the filter, by which fastening on the perforated plate can be dispensed with, and shifting of the perforated plate is on the one hand caused by an element and on the other hand by a reset spring made of standard material.

A filter of the abovementioned type can be used to particular advantage in a dishwashing machine. In a dishwashing machine the filter serves to filter out food remainders contained in the rinse water. This makes it necessary to rinse away deposited food remainders from the filter while running the rinsing cycle. Since the rinse water is at a different temperature during the individual rinsing procedures, e.g. prewash, cleaning, spray rinse, deep rinse, sections are formed during a temperature-dependent change to the passage cross-sections during the rinsing cycle, in which the cross-section of the filter openings is enlarged to the extent where deposited food remainders can be removed via the filter openings. This gives rise to a necessary self-cleaning operation of the filter.

The invention will now be explained in greater detail with reference to the embodiments illustrated in the diagram, in which :

Figure 1 shows plate-like filter plates, covered by a perforated plate, which is moved by only one spring element, according to a preferred embodiment of the invention,

Figure 2 shows another embodiment of the invention in which the perforated plate is moved by with two spring elements,

Figure 3 shows a partial cross-section of the filter in a state in which the filter openings are fully open,

Figure 4 shows a plan view of a filter opening of the filter in the position according to Figure 3,

Figure 5 shows a partial cross-section of the filter in a state in which the filter openings assume a desired filter cross-section, and

Figure 6 shows a plan view of a filter opening of the filter in the position according to Figure 5.

The embodiments are explained in the example of a filter 1 of a dishwashing machine, not illustrated in greater detail here. Identical parts have the same reference numerals.

The filter 1 has a plate-like body 2. In the illustrated embodiments this plate-like body 2 bears two filter plates 3. The plate-like body 2 is covered over by a perforated plate 5 having perforations approximately identical to those of a filter plate 3, and in the embodiment having perforations approximately identical to those of both filter plates 3.

According to the present invention the passage cross-section of the filter openings 4 can vary automatically depending on a variable inherent to the medium passing through the filter 1. This is accomplished in the illustrated embodiments by the fact that under the influence of the heat of the medium passing through the filter 1, of the washing liquid passing through the filter 1 in a dishwashing machine, in the illustrated embodiments the perforated plate b is moved by means of elements 7 on the filter plate 3, horizontally on the

whole plate-like body 2, by which the filter openings 4 are screened at least partially by the perforated plate 5 or are opened by its passage openings 6.

The elements 7 shifting the perforated plate 5 are spring elements, which are altered in their effective length under the influence of the heat of the medium passing through the filter 1, brought about by the fact that their material comprises a shape memory alloy. Such alloys change their form or position for example under the influence of heat. That is, when a specific temperature is reached they assume another form or take up another position and return to their original form or position whenever the original temperature prevails. Because in many technical processes a change in temperature occurs in the medium passing through the filter, cleaning of the filter is thus practically compulsory. Therefore at a specific temperature these spring elements 7 start to warp. This warping of the spring elements 7 leads to an increase of the effective length of the spring elements 7 and thus the perforated plate 5 is moved into a position, in which its passage openings 6 lie directly in the same position as the underlying filter openings 4 which are now fully open, as shown in Figures 3 and 4.

At another, for example higher temperature spring elements 7 take up a position, in which they practically shorten the effective length of the spring elements 7, by which the perforated plate 5 is moved into a position, in which its passage openings 6 partially cover the underlying filter openings 4, as shown in Figures 5 and 6. Only narrow slots therefore remain as passage cross-sections, as best seen in Figure 6. Since these slots are very narrow, ca. 0.2 mm, only correspondingly small particles contained in the medium can pass through these slots. In this

case the filter 1 has a high filter effect, that is, many particles are deposited. If the abovedescribed shift of the perforated plate 5 occurs as a result of a change in temperature, the deposited particles are removed through the enlarged passage cross-sections and the filter 1 is again clear.

Common to both illustrated embodiments is the fact that the spring elements 7 are supported on the one hand against a fixed edge, in the illustrated embodiments against an edge of the plate-like body 2, and on the other hand against an edge of the perforated plate 5, effectively dispensing with special, additional fastening means.

According to the preferred embodiment illustrated in Figure 1 only a spring element 7 is used which is affixed to the perforated plate 5, by which any change in the effective length of the spring element 7 is transferred directly to the perforated plate 5 as a change of position of the perforated plate 5.

According to the other embodiment illustrated in Figure 2 a spring element 7 is assigned a reset spring 8 arranged on opposite sides of the filter 1, which is made of customary spring steel, by which the abovedescribed fastening on the perforated plate 5 can be dispensed with. Shifting the perforated plate 5 is caused on the one hand by the spring element 7 and on the other hand by the reset spring 8, i. e. the spring element 7 moves the perforated plate 5 into the position as in Figure 3 and 4 and the reset spring 8 moves the perforated plate 5 into the position shown in Figures 5 and 6. In Figure 2 alternative arrangements are indicated for the reset spring 8, either on an edge of a central passage of the plate-like body 2 or on an outer edge of the plate-like body 2.

A filter 1 of the abovedescribed type can be used to particular advantage in a dishwashing machine not described in greater detail here. In a dishwashing machine the filter 1 serves to filter out food remainders left in the rinse water. This makes it necessary for deposited food remainders to be rinsed off the filter 1 from time to time during the rinsing cycle. As the rinse water is at a different temperature during the individual rinse procedures, e.g. prewash, wash, spray rinse, deep rinse, sections are formed during a temperature-dependent change to the passage cross-sections during the rinsing cycle, in which the cross-section of the filter openings is enlarged to the extent where deposited food remainders can be removed via the filter openings 4. This gives rise to a necessary self-cleaning operation of the filter 1.

The invention provides a filter which dispenses with the drawbacks of the prior art described at the outset.